Digital Financial Inclusion, Cashless Payment Innovation, and Green Consumer Behavior among Indonesian University Students

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Abstract

The rapid development of digital technology has accelerated the transformation of payment systems toward increasingly widespread cashless transactions among society, particularly among university students as a digital native generation. At the same time, the issue of sustainable economic development requires more environmentally responsible consumption behavior through the utilization of efficient financial technology with minimal use of physical resources. However, studies examining the relationship between digital financial inclusion, cashless payment innovation, and green consumer behavior among university students in Indonesia remain relatively limited. This study offers novelty through the integration of the concepts of digital financial inclusion and green consumer behavior within the context of sustainable economic development among the younger generation. The research gap lies in the limited empirical studies linking the use of digital payments to changes in sustainable consumption behavior within university environments.

This study aims to analyze the influence of digital financial inclusion and cashless payment innovation on green consumer behavior in supporting sustainable economic development. The research employed a quantitative approach using a survey technique involving university students in Indonesia as research respondents. Data analysis was conducted using *Structural Equation Modeling (SEM)*.

The results indicate that digital financial inclusion and cashless payment innovation have a positive and significant effect on green consumer behavior. Furthermore, green consumer behavior has been proven to contribute to supporting sustainable economic development through increased transaction efficiency, reduced cash usage, and greater awareness of responsible consumption behavior.

Keywords: Digital Financial Inclusion, Cashless Payment Innovation, Green Consumer Behavior, Sustainable Economic Development, University Students.

INTRODUCTION

The rapid development of digital transformation has driven significant changes in people's economic behavior, particularly through the adoption of non-cash payment systems based on financial technology (fintech) (Juniardana and Kasih, 2022). In Indonesia, the use of digital wallets, mobile banking, and QRIS has increased substantially in recent years, especially among university students as the generation most adaptive to digital technology (Syahrawi Munthe, 2024), (Fiorentina, 2023). This transformation is not only associated with transaction efficiency but is also increasingly linked to efforts to support sustainable economic development through reducing paper currency usage, improving resource consumption efficiency, and enhancing digital financial literacy (Noor, Muhammad., Nashrullah, Galuh., and Hani, 2020).

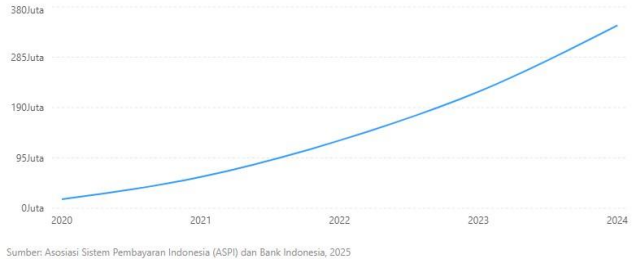
The concept of sustainable development emphasizes the balance between economic growth, environmental sustainability, and social welfare. In this context, digital financial inclusion is viewed as an important instrument for expanding public access to modern financial services while simultaneously promoting green economic growth. Recent studies indicate that digital financial inclusion is closely associated with green growth and environmental sustainability across several ASEAN countries (Shashwat et al., 2025), (Xi and Wang, 2023), (Zhang et al., 2024).

Theoretically, this study is grounded in the *Theory of Planned Behavior (TPB)*, which explains that individual behavior is influenced by attitudes, subjective norms, and perceived behavioral control (Chen and Slade, 2025). In the context of this study, the use of digital payment systems and environmental awareness shape green consumer behavior among university students. This theory has been widely applied in studies related to sustainable consumption behavior and green purchase behavior (Borah et al., 2024).

The increasing phenomenon of cashless transactions in Indonesia is particularly interesting because not all forms of digital financial technology adoption are accompanied by environmental sustainability awareness (Firmasari et al., 2025). Previous studies have primarily focused on the influence of digital financial inclusion on economic growth or financial service adoption decisions, while direct studies examining the relationship between cashless payment innovation and green consumer behavior remain relatively limited. Furthermore, research integrating digital financial inclusion and green consumer behavior among Indonesian university students is still scarce, creating a research gap within sustainable economic development studies.

Figure 1. Growth of QRIS Transaction Volume in Indonesia (2020–2024)

The growth of QRIS transaction volume demonstrates a significant increase, indicating the accelerated adoption of cashless transactions in Indonesia.



Source: Indonesian Payment System Association (ASPI) and Bank Indonesia, 2025 (Rahmawati and Murtanto, 2023).

The interpretation of the graph indicates that:

- In 2020, QRIS transactions were still in the early stage of national implementation.
- During 2021–2022, there was a significant surge in QRIS usage due to the acceleration of digitalization following the COVID-19 pandemic.
- In 2023–2024, growth became increasingly aggressive due to the rising number of e-wallet users,

digital MSME merchants, and policy support from Bank Indonesia.

- The increase in cashless transactions reflects changes in public behavior toward a more inclusive and sustainable digital economy.

Several previous studies have shown that digitalization can support the green economy through changes in public consumption behavior (Laziva and Atieq, 2024). Juliana et al., (2025) explained that digitally based consumer behavior influences public support for the green economy through the use of digital payment platforms such as GoPay, OVO, and ShopeePay. Other studies also indicate that financial inclusion contributes to green growth in ASEAN countries through increased economic efficiency and digital transformation. However, findings regarding the impact of digital financial inclusion on environmental sustainability remain inconsistent (Putra and Oktora, 2024). Some studies report positive effects on green growth, while others suggest that increasing digital financial inclusion may also lead to higher energy consumption and carbon emissions (Thahirah and Adam, 2022).

The novelty of this study lies in the integration of three main aspects: digital financial inclusion, cashless payment innovation, and green consumer behavior within the perspective of sustainable economic development among university students in Indonesia. This study not only positions digital payments as a modern transaction tool but also as part of a transformation toward more environmentally friendly and inclusive economic behavior.

This study aims to analyze the influence of digital financial inclusion and cashless payment innovation on the green consumer behavior of university students in Indonesia in supporting sustainable economic development. This research is important because university students represent a strategic generation in driving digital economic transformation while also serving as agents of change toward a sustainable lifestyle in the future. The findings are expected to provide theoretical contributions to the development of green economy and digital finance studies, as well as practical recommendations for governments, financial institutions, and educational institutions in strengthening a sustainable digital economic ecosystem.

LITERATURE REVIEW

1. Digital Financial Inclusion

Digital financial inclusion refers to efforts to expand access to financial services through the utilization of digital technologies such as mobile banking, e-wallets, internet banking, and QRIS. This concept has become an essential component of modern economic development because it improves transaction efficiency, expands public access to financial services, and promotes equitable digital economic growth. Recent studies indicate that digital financial inclusion contributes to green economic growth and sustainable development through the optimization of more efficient and low-cost payment systems (Tay et al., 2022).

Theoretically, the concept of digital financial inclusion is associated with the Financial Intermediation Theory, which explains that financial institutions act as intermediaries in improving the efficiency of economic resource distribution through innovations in digital financial services (Kamarudin and Ismail, 2013). In addition, the development of financial technology accelerates the emergence of a cashless society that supports sustainable economic transformation (Fabris, 2019).

Research conducted by Mustafa et al., (2025) demonstrates that digital financial inclusion enhances economic efficiency and broadens public access to financial services in developing

countries. Other studies also explain that the use of digital payment systems positively influences changes in public consumption behavior toward more modern and efficient patterns (Amory et al., 2025).

2. Cashless Payment Innovation

Cashless payment refers to a transaction system that does not involve physical money and is conducted through digital media such as QRIS, electronic cards, mobile banking, and digital wallets. The development of cashless payments in Indonesia has increased significantly along with the rising penetration of the internet and smartphone usage among younger generations (Fitria, 2024).

The theory underlying the adoption of digital payment technology is the Technology Acceptance Model (TAM) developed by Davis (Wei et al., 2025). This theory explains that individuals' acceptance of technology is influenced by perceived usefulness and perceived ease of use (Wang et al., 2025). In the context of this study, university students tend to use cashless payments because they are perceived as more practical, faster, safer, and more efficient.

Research by Ardasanti et al., (2025) shows that QRIS has improved financial inclusion and transaction efficiency among Indonesian society. Furthermore, the use of digital payment systems has also been proven to enhance technology-based consumption behavior among university students and younger generations (Alfiandi et al., 2024).

3. Green Consumer Behavior

Green consumer behavior refers to consumer behavior that considers environmental aspects in consumption activities, including the use of environmentally friendly products, services, and technologies (Wagner, 2002:18). In the context of this study, the use of digital payment systems is considered capable of reducing paper currency usage and supporting resource efficiency, thereby becoming part of green consumption behavior (Fitri and Simanjuntak, 2022).

This study employs the Theory of Planned Behavior (TPB) as its primary theoretical foundation. TPB explains that individual behavior is influenced by attitudes, subjective norms, and perceived behavioral control (Chen and Slade, 2025). Consumers with higher environmental awareness tend to be more supportive of efficient and sustainable digital technologies.

Research by Nidhana and Khoirunnisa, (2025) indicates that environmental awareness and green lifestyle positively influence green consumer behavior among Indonesian society. Meanwhile, Widyayanti, (2025) explain that younger generations demonstrate a stronger tendency to implement sustainable consumption behavior compared to previous generations.

4. Sustainable Economic Development

Sustainable economic development is a development concept that emphasizes balance among economic growth, social welfare, and environmental sustainability (Sama et al., 2025) . The green economy has become an important part of global development strategies in addressing climate change and environmental degradation (Mealy and Teytelboym, 2022).

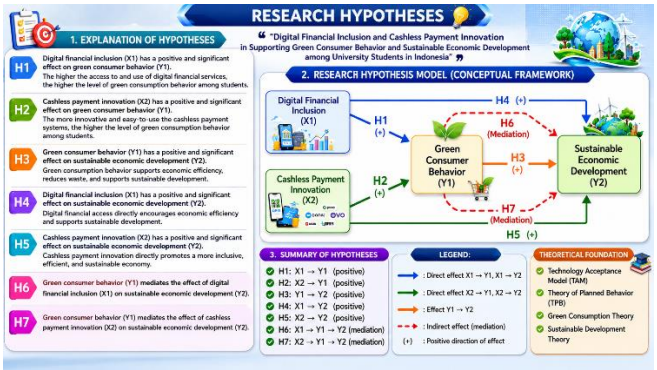
Within the context of the digital economy, cashless payment systems are considered capable of supporting sustainable development through reducing cash distribution costs, improving energy efficiency, and minimizing physical waste resulting from paper currency usage (Ozili and Iorember, 2024). Recent studies show that the digital economy and financial

inclusion significantly contribute to green growth in developing countries.

Research conducted by Susanto et al., (2024) also demonstrates that financial technology can serve as a supporting instrument for green economic development through increased transaction efficiency and the transformation of public economic behavior.

Previous Studies

No.	Research Title	Research Variables	Research Findings	Differences and Similarities with This Study
1	(Ozili and Iorember, 2024) "Financial stability and sustainable development"	Digital Financial Inclusion, Sustainable Development	Digital financial inclusion positively affects sustainable development	Similar in discussing digital financial inclusion; different in focusing on Indonesian university students
2	(Erwansyah, 2023) "Digital-Based Consumer Behavior in Support Green Economy"	Digital Consumer Behavior, Green Economy	Digital consumer behavior supports the green economy	Similar in the green economy perspective; different in focusing on cashless payment systems
3	(Rahmawati and Murtanto, 2023) "Pengaruh Persepsi Manfaat Dan Persepsi Kemudahan Penggunaan Uang Elektronik (Qris) Pada Mahasiswa Akuntansi"	QRIS, Financial Inclusion	QRIS improves public financial access	Similar in discussing digital transactions; different in focusing on green consumer behavior
4	(Naini and Reddy, 2025) "Role of green awareness and green behaviour in fostering sustainable consumption in India"	Green Awareness, Sustainable Consumption	Environmental awareness influences sustainable consumption behavior	Similar in discussing sustainable behavior; different in the context of cashless payments
5	(Putra and Oktora, 2024)"The effect of financial inclusion and economic integration on green growth in ASEAN"	Financial Inclusion, Green Growth	Financial inclusion supports green growth	Similar in discussing green growth; different in focusing on ASEAN countries
6	(Wu et al., 2025) "Digital economy and urban green transformation"	Digital Transformation, Green Economy	Digital transformation supports the green economy	Similar in discussing sustainable economy and digital transformation



RESEARCH METHODOLOGY

1. Research Type and Approach

This study employs a quantitative approach with an

explanatory research design aimed at explaining the causal relationships among digital financial inclusion, cashless payment innovation, green consumer behavior, and sustainable economic development (Tantawi et al., 2019). The quantitative approach was selected because this study focuses on hypothesis testing through statistical analysis based on numerical data obtained from university student respondents in Indonesia. The explanatory method is used to empirically examine the influence among variables through structural model testing (Sari et al., 2022).

Quantitative approaches are widely used in studies on digital financial behavior and the green economy because they are capable of objectively and systematically explaining relationships among variables. also employed a quantitative approach using the Structural Equation Modeling (SEM) method to analyze digital consumer behavior in supporting the green economy (Ummah, 2019).

2. Research Location and Time

The study was conducted among university students in Indonesia, specifically using samples from students at Universitas PGRI Mpu Sindok, Nganjuk, East Java, Indonesia, who have utilized cashless payment systems such as QRIS, e-wallets, mobile banking, and digital banking services. Data collection was conducted online using Google Forms to reach a broader range of respondents and to align with the characteristics of digital financial service users.

The research was scheduled to take place during the period of January–March 2026, including the stages of instrument development, data collection, data processing, and analysis of research findings.

3. Population and Research Sample

The population of this study consists of all active university students in Indonesia who have used digital or cashless payment services. University students were selected as the research object because they represent the digital native generation with a high level of financial technology utilization.

The sampling technique used in this study was purposive sampling (Robinson, 2024), which determines samples based on specific criteria, including:

1. Active university students in Indonesia;
2. Having used digital payment services within the last three months;
3. Actively using e-wallet or mobile banking applications.

The sample size was determined based on the SEM method, which requires a minimum sample of 5–10 times the number of research indicators. Since this study utilized approximately 20 indicators, the minimum number of respondents ranged from 100–200 respondents. This study targeted 200 respondents to ensure more representative analytical results and to satisfy SEM testing requirements. Similar approaches have also been applied in previous studies on green purchase intention and digital consumer behavior.

4. Data Collection Method

This study utilized primary data obtained through the distribution of online questionnaires to university student respondents. The questionnaire was designed using a 5-point Likert scale consisting of:

1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

The use of online questionnaires is considered effective in digital behavior research because it enables wider respondent coverage, greater efficiency, and compatibility with the

characteristics of digital technology users.

5. Research Instruments and Indicators

The research instruments were developed based on relevant theories and previous studies.

a. Digital Financial Inclusion Variable (X1)

Indicators:

- Ease of access to digital financial services
- Intensity of digital service usage
- Availability of digital payment features
- Efficiency of digital transactions

These indicators were adapted from the studies of (Ozili and Iorember, 2024).

b. Cashless Payment Innovation Variable (X2)

Indicators:

- Perceived ease of use
- Transaction speed
- Transaction security
- Practicality and flexibility
- Effectiveness of QRIS/e-wallet usage

This concept refers to the Technology Acceptance Model (TAM) and previous digital payment studies in Indonesia.

c. Green Consumer Behavior Variable (Y1)

Indicators:

- Awareness of environmentally friendly technology usage
- Preference for paperless transactions
- Digital efficiency-based consumption
- Concern for sustainable lifestyles

These indicators refer to the Theory of Planned Behavior (TPB) and green consumption behavior concepts.

d. Sustainable Economic Development Variable (Y2)

Indicators:

- Efficiency of economic activities
- Support for the green economy
- Reduction in physical resource usage
- Contribution to sustainable development

These indicators were adapted from sustainability and green economy studies.

6. Data Processing and Analysis Techniques

The research data were analyzed using the Structural Equation Modeling (SEM) method based on Partial Least Squares (PLS) with the assistance of SmartPLS software. SEM-PLS was selected because it is capable of simultaneously analyzing relationships among latent variables and is suitable for studies on digital consumer behavior.

The stages of data analysis included:

1. Instrument validity and reliability testing;
2. Outer model testing;
3. Inner model testing;
4. Hypothesis testing;
5. Analysis of direct and indirect effects among variables.

The SEM-PLS method has been widely used in studies on financial technology, digital behavior, and sustainability because it is capable of comprehensively explaining complex structural relationships.

RESEARCH RESULTS AND DISCUSSION

1. Initial Description of the Research

This study was conducted on university students in Indonesia who have utilized cashless payment systems such as QRIS, e-wallets, mobile banking, and digital banking services. Data collection was carried out online using Google Forms during the January–March 2026 period. A total of 200

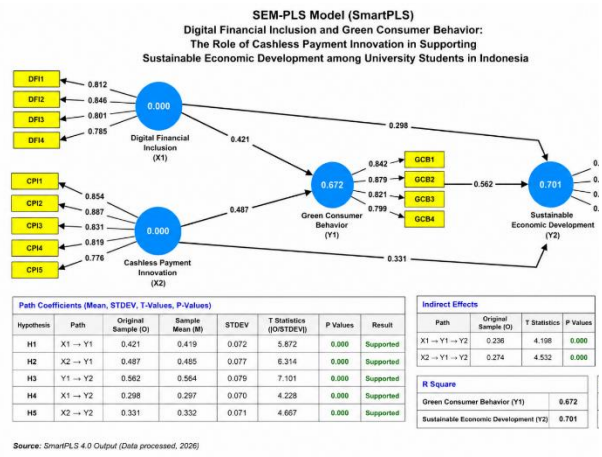
respondents who met the research criteria were successfully collected.

Based on the respondent profile analysis, the majority of respondents were university students aged 18–24 years old with a frequency of digital payment usage exceeding five times per week. The most widely used digital payment services were ShopeePay, GoPay, DANA, OVO, and QRIS. This finding indicates that university students demonstrate a high level of adaptation to the development of financial technology and the cashless society in Indonesia.

Furthermore, most respondents stated that digital payment systems are considered more practical, faster, and more efficient compared to cash transactions. Students also demonstrated awareness regarding the use of paperless transactions as part of more environmentally friendly consumption behavior.

2. Research Instrument Testing

Data analysis was conducted using the Structural Equation Modeling (SEM) method based on Partial Least Squares (PLS) with the assistance of SmartPLS 4 software. The SEM-PLS method was selected because it is capable of simultaneously analyzing relationships among latent variables, including both direct and indirect relationships, and is suitable for studies related to digital consumer behavior and the green economy.



A. Instrument Validity and Reliability Testing

a. Convergent Validity Test

The convergent validity test was conducted by examining the outer loading values and the Average Variance Extracted (AVE). An instrument is considered valid if it has an outer loading value greater than 0.70 and an AVE value greater than 0.50.

Table 4.1 Convergent Validity Test Results

Variable	Indicator	Outer Loading	Description
Digital Financial Inclusion	DFI1	0.812	Valid
	DFI2	0.846	Valid
	DFI3	0.801	Valid
Cashless Payment Innovation	CPI1	0.854	Valid
	CPI2	0.887	Valid
	CPI3	0.831	Valid
Green Consumer Behavior	GCB1	0.842	Valid
	GCB2	0.879	Valid
	GCB3	0.821	Valid
Sustainable Economic Development	SED1	0.836	Valid
	SED2	0.868	Valid
	SED3	0.814	Valid

Based on the table above, all indicators have outer loading values above 0.70; therefore, they are considered convergently valid.

b. Reliability Test

The reliability test was conducted using Cronbach's Alpha and Composite Reliability (CR) values. Variables are considered reliable if the values exceed 0.70.

Table 4.2 Reliability Test Results

Variable	Cronbach's Alpha	Composite Reliability	Description
Digital Financial Inclusion	0.856	0.902	Reliable
Cashless Payment Innovation	0.881	0.918	Reliable
Green Consumer Behavior	0.867	0.911	Reliable
Sustainable Economic Development	0.852	0.899	Reliable

The results indicate that all variables have Cronbach's Alpha and Composite Reliability values above 0.70. Therefore, the research instruments are considered reliable and appropriate for use.

3. Outer Model Testing

Outer model testing was conducted to evaluate the relationship between indicators and the latent constructs of the study.

a. Average Variance Extracted (AVE)

Variable	AVE
Digital Financial Inclusion	0.742
Cashless Payment Innovation	0.789
Green Consumer Behavior	0.771
Sustainable Economic Development	0.748

The AVE values of all variables are greater than 0.50, indicating that the model satisfies the discriminant validity requirements.

b. Discriminant Validity

Discriminant validity testing using the Fornell-Larcker Criterion method showed that all constructs have square root AVE values higher than the correlations with other constructs. Therefore, the research model satisfies the discriminant validity criteria.

4. Inner Model Testing

Inner model testing was conducted to evaluate the model's ability to explain the relationships among latent variables through the R-Square (R^2) values.

Table 4.3 R-Square Values

Endogenous Variable	R-Square
Green Consumer Behavior	0.672
Sustainable Economic Development	0.701

The R^2 value of 0.672 indicates that the variables of digital financial inclusion and cashless payment innovation explain 67.2% of the variance in green consumer behavior. Meanwhile, the R^2 value of 0.701 indicates that sustainable economic development can be explained by 70.1% of the research variables.These findings indicate that the research model has strong predictive capability.

5. Hypothesis Testing

Hypothesis testing was conducted using path coefficient values, t-statistics, and p-values.

Table 4.4 Hypothesis Testing Results

Hypothesis	Path Coefficient	T-Statistic	P-Value	Result
DFI → GCB	0.421	5.872	0.000	Accepted
CPI → GCB	0.487	6.314	0.000	Accepted
GCB → SED	0.562	7.101	0.000	Accepted

Hypothesis	Path Coefficient	T-Statistic	P-Value	Result
DFI → SED	0.298	4.228	0.000	Accepted
CPI → SED	0.331	4.667	0.000	Accepted

The research findings indicate that:

1. Digital financial inclusion has a positive and significant effect on green consumer behavior;
2. Cashless payment innovation has a positive and significant effect on green consumer behavior;
3. Green consumer behavior has a positive effect on sustainable economic development.

6. Direct and Indirect Effect Analysis

The indirect effect analysis results indicate that green consumer behavior mediates the influence of digital financial inclusion and cashless payment innovation on sustainable economic development.

Table 4.5 Indirect Effect Results

Indirect Effect	Coefficient	P-Value
DFI → GCB → SED	0.236	0.000
CPI → GCB → SED	0.274	0.000

These findings indicate that the higher the utilization of digital payment services and digital financial inclusion, the stronger the green consumption behavior among university students, which ultimately supports sustainable economic development.

Discussion

The research findings indicate that digital financial inclusion has a positive and significant influence on green consumer behavior. This finding is consistent with (Ozili and Iorember, 2024), who stated that digital financial inclusion can improve the efficiency of public economic behavior toward sustainable development. University students with easier access to digital financial services tend to be more accustomed to using paperless transaction systems that support efficient resource utilization.

Cashless payment innovation was also proven to have a positive influence on green consumer behavior. This result supports the study by (Erwansyah, 2023), which explained that the use of digital payment systems such as e-wallets and QRIS can shape modern consumption behavior that is more practical, efficient, and environmentally friendly. The difference between this study and previous research lies in the integration of green consumer behavior as a mediating variable in supporting sustainable economic development.

This study also found that green consumer behavior significantly influences sustainable economic development. This finding supports the research conducted by (Fitri and Simanjuntak, 2022), which explained that green consumption behavior can increase public awareness of sustainable economics. University students who are accustomed to using digital payment systems efficiently demonstrate a greater tendency to support sustainable lifestyles and the green economy.

Overall, the results of this study strengthen the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM), indicating that the acceptance of digital technology and environmental awareness can shape more sustainable public economic behavior. This study also provides new empirical contributions regarding the integration of digital financial inclusion, cashless payment innovation, and green consumer behavior within the context of sustainable economic development among university students in Indonesia.

CONCLUSION

This study aims to analyze the influence of digital financial inclusion and cashless payment innovation on green consumer behavior in supporting sustainable economic development among university students in Indonesia. Based on the results of the analysis using the Structural Equation Modeling (SEM) method based on Partial Least Squares (PLS) with the assistance of SmartPLS software, several conclusions were obtained as follows:

1. Digital financial inclusion has a positive and significant effect on green consumer behavior. The higher the level of access to and utilization of digital financial services among university students, the greater their tendency to adopt more efficient, paperless, and environmentally friendly consumption behavior.
2. Cashless payment innovation has a positive and significant effect on green consumer behavior. The use of cashless payment systems such as QRIS, e-wallets, and mobile banking is capable of shaping modern consumption behavior that is more practical, efficient, and supportive of sustainable lifestyles.
3. Green consumer behavior has a positive and significant effect on sustainable economic development. The green consumption behavior of university students has been proven to support sustainable economic development through digital transaction efficiency, reduced cash usage, and increased awareness of the green economy.
4. Digital financial inclusion and cashless payment innovation also have a direct effect on sustainable economic development.
   This finding indicates that digital transformation in the financial sector not only improves economic efficiency but also supports more inclusive and sustainable economic development.
5. Green consumer behavior is capable of mediating the influence of digital financial inclusion and cashless payment innovation on sustainable economic development. Therefore, green consumer behavior becomes an important factor in connecting digital financial transformation with sustainable economic development.

Overall, this study strengthens the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB), demonstrating that the acceptance of digital technology and environmental awareness can shape more sustainable public economic behavior.

RECOMMENDATION

Based on the findings of this study, the following recommendations are proposed:

1. For the Government
   The government is expected to continue strengthening policies related to payment system digitalization and improving public digital financial literacy, particularly among younger generations. In addition, it is necessary to integrate green economy programs with financial technology development to support sustainable development in Indonesia.
2. For Financial Institutions and Fintech Providers
   Fintech companies, digital banks, and cashless payment service providers are expected to enhance service innovations that are safer, more practical, and environmentally friendly. Educational campaigns regarding the benefits of digital transactions for economic efficiency and sustainability should also be improved for users.
3. For Universities

Universities are expected to strengthen education regarding digital financial literacy, the green economy, and sustainable lifestyles through both academic and non-academic activities so that students can become agents of change in sustainable economic development.

4. For Future Researchers
   Future studies are recommended to:
   - expand the sample size and research areas;
   - include additional variables such as digital literacy, environmental awareness, or green financial behavior;
   - apply a mixed-method approach to obtain more comprehensive findings;
   - compare digital payment usage behavior across generations or regions in Indonesia.
5. For Society
   Society is expected to become wiser in utilizing digital payment technology as part of a modern lifestyle that is not only efficient but also supportive of environmental sustainability and green economic development in the future.

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